

Management of Patients with Chronic Kidney Disease Presenting with Acute Coronary Syndrome

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Abstract

We evaluated the treatment pattern of patients with chronic kidney disease presenting with acute coronary syndromes. In a retrospective chart review of 400 patients with and without kidney disease presenting with angina pectoris we found that patients with chronic kidney disease have longer hospital stays, receive fewer diagnostic angiographies, and have a delay in therapy.

Introduction

Chronic kidney disease is a significant morbidity in the United States with approximately 1,400 people per million of the population affected with this disease.¹ Cardiovascular disease is a major cause of death in patients with chronic kidney disease (CKD) accounting for approximately 45% of all deaths in this population.¹ This increased prevalence of cardiac disease in CKD patients is thought to be due to multiple factors including a high incidence of cardiac risk factors in patients with CKD.^{2,3} Past studies have shown a large percentage of dialysis patients have traditional cardiac risk factors including hypertension, diabetes, dyslipidemia, as well as increasing age.² In addition, patients with CKD have other cardiac risk factors unique to renal disease including increased calcium intake, hyperhomocysteinemia, anemia, and increased oxidant stress secondary to uremia.⁴ Together, these multiple factors create a vasculopathic state leading to accelerated atherosclerosis and may influence mortality rates in patients with CKD.^{7,8}

In addition to increased risk factors for cardiac disease, there may also be differences in the management of acute coronary syndromes (ACS) in patients with CKD as compared to patients with normal renal function. Previous studies have shown an under use of therapies for CAD in patients with CKD, including aspirin therapy, beta-blockers, thrombolytics and revascularization procedures.⁴ There is a paucity of data examining the use of these therapies during an acute presentation of ischemic cardiac disease. Furthermore it is unknown if differences in treatment between patients with and without renal disease affects length of hospital stay. The goal of this study was to

evaluate the utilization of cardiac testing and length of stay in patients with CKD presenting with ACS.

Methods

After approval by the appropriate institutional review boards, an analysis of computerized discharge diagnosis was performed at two major hospitals in Honolulu, Hawaii from January 2001 until June 2003. Patients carrying an ICD9 code for acute coronary syndrome and chronic renal failure as primary or secondary diagnosis were included. Patients with a creatinine of less than 1.5 mg/dl on admission were excluded from the analysis. The second group of patients with ACS without CKD was identified during the same period of time. In both groups, patients with acute renal failure were excluded from analysis.

Demographic and clinical data were extracted as specified in the results section. Normally distributed data is reported as mean and standard deviation (\pm SD), non-normally dispersed data is presented as median and interquartile range. Characteristics between the two groups were compared by Chi-Square for dichotomous variables and Mann-Whitney U Test and Student's T-test for continuous variables. To determine the independent association between time until EKG obtained and the existence of renal failure, as well for the association between length of stay and presence of CKD we used binary logistic regression analysis. Alpha-level was set at 0.05. Statistical analyses were performed with the use of SPSS version 10.0 (Chicago, IL).

Results

We identified 200 patients with and 200 patients without CKD admitted for ACS. Patients with CKD were more likely to be older, female, and more frequently had diabetes, hypertension, a history of myocardial infarction, cerebral vascular disease, and peripheral vascular disease as compared to patients with normal renal function. The patients with CKD were more likely to have atrial fibrillation, have prior congestive heart failure, and more commonly presented with heart failure compared to non CKD patients.

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All patients presented at a median time of 4 hours to the ER ($p=0.9$). Initial EKG was obtained later in CKD-patients (pts) than non CKD-pts (29 minutes vs. 12 minutes (median), $p=0.002$). Regression analysis including baseline characteristics, Killip class and angina type, confirmed renal disease as being associated with >20 minute delay in obtaining initial EKG (Odds Ratio (OR)=3.91, 95% CI 2.20 to 6.94, $p<0.0001$). Thirty-two percent of pts with CKD and 21% of non CKD-pts underwent stress testing ($p=0.007$). Diagnostic angiography was performed less often in patients with CKD compared to patients with normal renal function. CKD-pts had significantly longer time intervals between admission and coronary angiography (median 2 days) than non CKD-pts (median 1 day, $p=0.001$).

Aspirin, Clopidogrel, GPIIb/IIIa-Inhibitors, Enoxaparin, and IV heparin were less frequently administered to CKD patients. CKD-pts median length of stay was seven days compared to four days in non CKD-pts ($p<0.0001$). Controlling for demographics, severity of disease, hemoglobin, bleeding complications, and angiographic procedures, logistic regression analysis identified chronic renal failure (OR=4.97, 95% CI 2.79 to 8.83; $p<0.0001$) as one of the strongest predictors for hospital stays longer than five days.

Discussion

Our study identified a delay in diagnostic work up in patients with CKD presenting with ACS. This included a delay in obtaining an EKG as well as delay in performing a coronary angiography. In addition to a increased length of time from admission to coronary angiography, patients with CKD also had diagnostic angiographies performed less often compared to patients with normal renal function. This finding of less aggressive evaluation is somewhat surprising given the fact that patients with CKD are known to have a higher incidence of cardiac disease and have a worse prognosis. In addition, in this high risk population sufficient therapy would make the biggest impact on survival. Based on our study we are unable to determine why there is a delay in obtaining an EKG in patients with CKD. Possible explanations include a higher incidence of atypical presentations of ACS in this population, an inadequate clinical suspicion of ACS in these patients, or an underestimation of the urgency of diagnosing ACS. Further studies would be needed to explain these findings. In addition our observations emphasize the need to further understand the reason for less aggressive evaluation and to create policies for improved diagnosis of ACS.

In addition to less frequently used diagnostic angiography, we found that patients with CKD received less medical therapy for ACS compared to patients with normal renal function. These findings are consistent with previously published studies that have

Table 1.— Baseline characteristics

Variable	CKD (n=200)	Non-CKD (n=200)	P-value
Age	69 ± 13.3	66.5 ± 13.7	0.079
Female	48%	29%	<0.0001
Ethnicity			
Caucasian	16%	34%	
Asian	58%	44.5%	
Pacific Islander	24%	13%	
Killip Class*			
Class I	58%	85%	
Class II	36%	7%	
Class III	20%	2%	
Class IV	7%	1%	
Comorbidities			
AMI	41%	14%	<0.0001
CVA	23%	6%	<0.0001
CHF	37%	3.5%	<0.0001
PVD	14%	2%	<0.0001
Afib	15%	4.5%	<0.0001
DM using insulin	28%	8%	<0.0001
DM not using insulin	19%	16%	0.372
Hypertension	88%	63%	<0.0001
Hyperlipidemia	40%	42%	0.729

Table 2.— Diagnostic Testing

Variable	CKD (200)	Non-CKD (200)	P-value
Stress testing (%)	32	21	0.007
Dx angiogram (%)	34	76	<0.0001
Time to EKG (min.)	29	12	0.002
Time to angiogram (days)	2	1	0.001

found that patients with CKD receive less adjunctive medical therapies as well as reperfusion procedures. The decrease in use of anti coagulation medications may be explained by a fear of increased risk of bleeding in patients with renal insufficiency. There are no prospective studies to confirm an increase risk of bleeding in this population, since patients with CKD are excluded from studies on anti-coagulant therapy. Further prospective studies are needed to clarify outcomes of patients with CKD treated with anti coagulant therapy.

We observed that chronic kidney disease was identified as a predictor of prolonged hospital stay based on regression analysis. The association was independent of severity of disease at admission, bleeding complications, and angiographic procedures performed. This finding is in contrast to the fact that we found that these patients received less invasive testing. Possible

reasons for this decrease in use of invasive testing include a fear of worsening renal function with invasive testing or a concern of higher rates of complications in this population. Further large-scale studies are required to explain why this population has longer hospital stays. This focus on length of hospital stay has become increasingly important given the growth of managed care plans, cost containment programs, and overall emphasis on hospital economics.

Because this was a retrospective study, our study was limited by the fact that we are unable to make conclusions of cause and effect, but rather only indicate associations. In addition there is the potential for referral bias as with any observational study. Finally the ethnic diversity found in our study with a minority of Caucasian patients may limit whether this study can be applied to other populations.

Conclusion

Patients with CKD presenting with CKD have a delay in their diagnostic workup and receive fewer diagnostic angiographies as compared to patients with normal renal function. In addition, CKD is a strong predictor of a prolonged hospital stay.

References

1. Causes of death. In: U.S. Renal Data System. USRDS 2003 Annual Data Report: Atlas of End-Stage Renal Disease in the United States. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2003. Accessed on the Internet: <http://www.usrds.org/adr.htm>. February 10, 2004.
2. Jungers P, Massy ZA, Khoa TN, Fumeron C, Labrunie M, Lacour B. Incidence and risk factors of atherosclerotic cardiovascular accidents in peritoneal chronic renal failure patients: a prospective study. *Nephrol Dial Transplant*. 1997; 12:2597-602.
3. Beattie JN, Soman SS, Sandberg KR, et al. Determinants of mortality after myocardial infarction in patients with advanced renal dysfunction. *Am J Kidney Dis* 2001; 37(6): 1191-1200.
4. Walsh CR, O'Donnell CJ, Camargo CA Jr, Giugliano RP, Lloyd-Joens DM. Elevated serum creatinine is associated with 1-year mortality after acute myocardial infarction. *Am Heart J*. 2002 Dec; 144(6): 1003-11.
5. Naidu SS, Selzer F, Jacobs A, et al. Renal insufficiency is an independent predictor of mortality after percutaneous coronary intervention. *Am J Cardiol* 2003; 92:1160-64.
6. Beattie JN, Soman SS, Sandberg KR, et al. Determinants of mortality after myocardial infarction in patients with advanced renal dysfunction. *Am J Kidney Dis* 2001; 37(6): 1191-1200.
7. Herzog CA, Ma JZ, Collins AJ. Poor long-term survival after acute myocardial infarction among patients on long-term dialysis. *N Engl J Med* 1998; 339:799-805.
8. Luke RG. Chronic renal failure--a vasculopathic state. *NEJM* 1998; 339: 841-43.
9. Hall MJ, DeFrances CJ. 2001 National Hospital Discharge Survey. *Advance Data* April 9, 2003

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